RADIO TOMOGRAPHY IN THE STUDY OF PLANETARY IONOSPHERES

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The propagation of gigahertz radio waves through tenuous ionospheres can be assumed to occur with negligible refractive bending. In this case the propagation path can be assumed to be a straight line. The observed phase delay (or advance) observed along each such "ray" can then be converted to the total electron content (TEC) in units of columnar electron density (c.f., cm^{-2}).

For the purpose of tomographic analysis, the space under study is divided into cells in which the electron volume density is assumed to be constant. The initial values of electron density for each cell is provided by interpolation of electron density profiles obtained from Abelian inversion of radio occultation data, for which spherical symmetry must be assumed . The TEC is then computed along each ray and compared to the observed value, and the electron density in each cell is iteratively adjusted according to a specific algorithm until a criterion of the difference between observed and computed TEC values is minimized.

Examples of the application of this technique to Galileo radio occultation data on the Io ionosphere will be presented.

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